Carbon Sequestration on Continentally Important FWS Ecosystems: Using Structured Decision Making to Develop a Cohesive Approach to a Diversity of Conditions

Summary Report from Structured Decision Making Workshop
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COMPONENTS OF THE DECISION FRAMEWORK

Background

Global climate change is recognized by the USFWS as the major challenge of our times for conservation of trust resources. The importance of carbon sequestration as a tool for mitigating emission of greenhouse gases, and for long-term storage of carbon is evidenced by the FWS establishment of a national Biological Carbon Sequestration Working Group. At their first meeting held on April 7, 2009, in Arlington, West Virginia, several priorities were established. Though information exists for forested land in the lower 48 states, the science needed to effectively define the contribution of carbon sequestration by many other types of ecosystems is lacking. Initial discussions have identified shrublands, wetlands/peatlands, Midwestern grasslands, boreal forest and other ecosystems with significant below ground carbon stores as important foci for future study.

The USFWS's Land Management and Demonstration (LMRD) program focuses on diverse ecosystems on refuges located throughout the country, including shrub steppe, arid riparian wetland, salt marsh, tallgrass prairie/savanna, bottomland hardwood forest, longleaf pine forest, and boreal forest as focal ecosystems for research and demonstration on Refuge lands. These ecosystems provide a good match for the systems identified as important for carbon sequestration study in the Biological Carbon Sequestration Science breakout session.

Decision Problem

Carbon sequestration is a complex problem encompassing a broad array of topics. Our overarching objective is to evaluate carbon storage and exchange on LMRD ecosystems to begin to quantify the contributions provided by the FWS's land conservation efforts that have been ongoing for more than a century, and also to evaluate future carbon sequestration potential. Outcomes of the efforts addressed herein would provide the basis for informing future FWS management and policy decisions within the context of climate change. Proposed outcomes would be accomplished within the context of the establishing purposes of each LMRD refuge while addressing conservation responsibilities to manage for trust resources, provide ecosystem services and minimize threats and vulnerabilities to those resources. This overarching goal was defined:

Evaluate carbon storage and exchange on LMRD ecosystems in order to quantify the carbon sequestration contribution of these ecosystems, and inform future management and policy decisions in the context of refuge purposes, trust resource conservation goals, ecosystem services, and threats and vulnerabilities.

To effectively address the problem and further define our focus, the team evaluated many alternative ways of articulating carbon sequestration issues. After much consideration and discussion the above statement was refined to the following statement.

Problem Statement:

What is the best research strategy for comparing and quantifying carbon storage and exchange among LMRD ecosystems?

Objectives

Once we defined the problem statement, we established a number of objectives which would be used as the basis for evaluating alternative methods for addressing that problem.

Those objectives are:
1) timeliness
2) answers research question
3) credibility
4) completeness of data
5) comparability
6) relevance to overarching FWS needs'
7) synergistic with LCCs and I & M
8) transferability

Assumptions

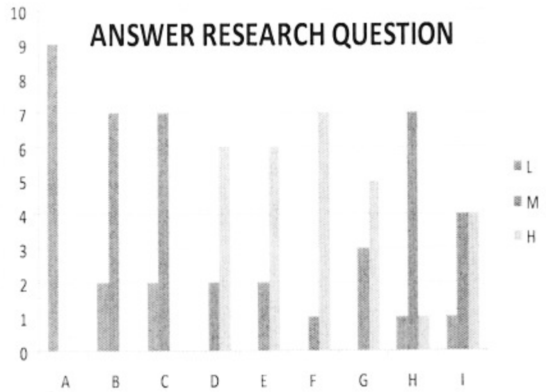
At this point, we assumed that cost was not a limiting factor. However, this will be included in future evaluations.

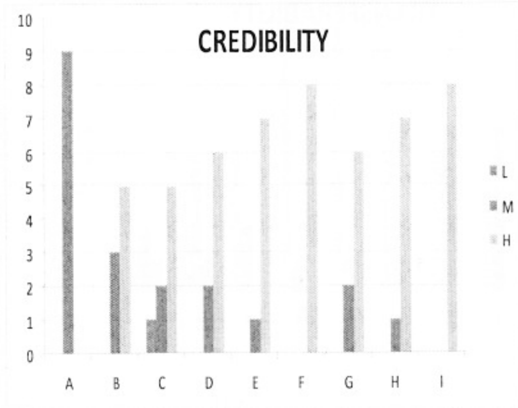
Alternative Actions

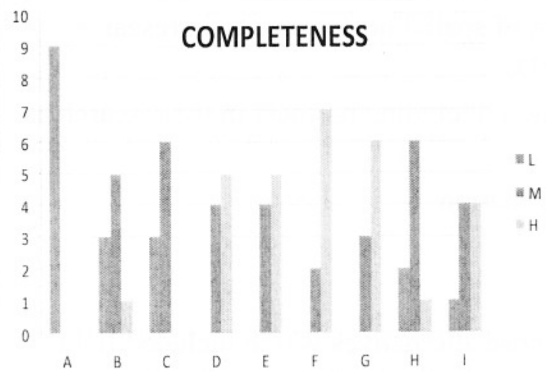
Initially we considered nine alternatives:
a) Conduct all literature research and no field research (no new data)
b) Assess carbon storage using field-based methodology on all LMRDs
c) Initiate field-based carbon exchange research
d) Conduct dual field-based projects around storage and exchange in tandem

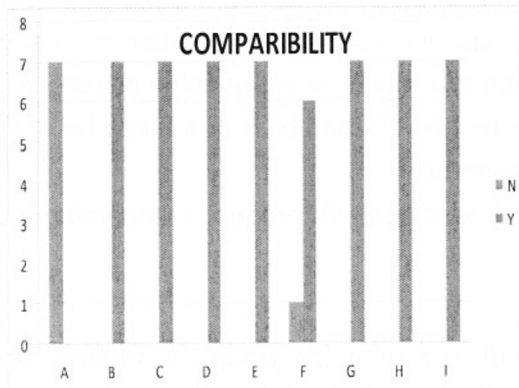
e) Conduct field-based projects in sequence; first storage, then exchange
f) Conduct literaure Initial focus on existing research; identify gaps in existing field research (including storage and/or exchange). Then fill gaps in field research.
g) Conduct literature research to fill gaps and conduct field research (includes storage and/or exchange) at the same time
h) Two timelines: compare field measures of historic (e.g., relatively undisturbed) to current carbon storage, and calculate change in storage.
i) Three timelines: assess three timelines of carbon storage and exchange. (e.g., 1800's or anthropogenic to current, current, pre-anthropogenic influence)

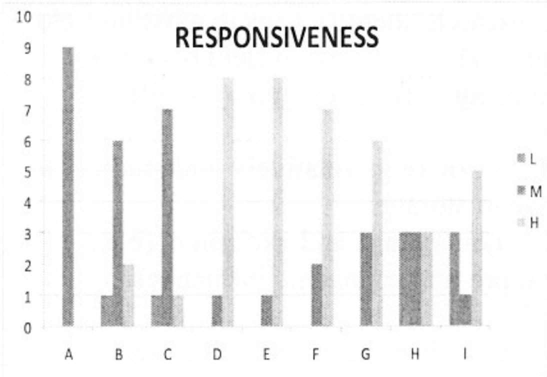
The following graphs compare the alternative actions against the stated objectives.

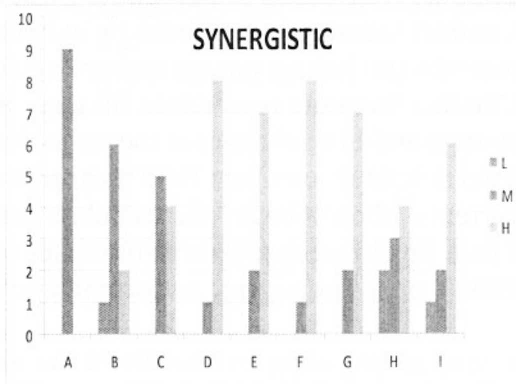


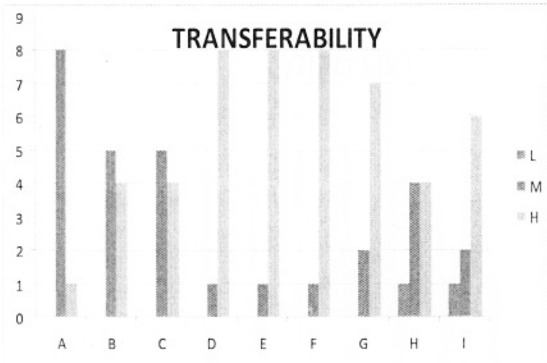












Common Characteristics of Alternative Actions

- Assess the relationship of land management actions to carbon storage. Evaluate carbon exchange differences under different land management practices.
- Each alternative/strategy will state the amount of spatial heterogeneity in research design and it will be comparable across LMRDs
- Use the LMRD land base as a focus for research, including partners in the research as appropriate.
- All alternatives will produce comparable information

Results

The initial scoring by the group was highest for those alternatives which included field based methods for both carbon storage and exchange; furthermore, those alternatives which included a thorough literature review and/or gap analysis were highly ranked. This reduced the initial field of nine alternatives to five and generated additional discussions that led to more clearly defined alternatives and more consistent ranking by team members. Additionally, in order to differentiate among the reduced set of five alternatives, we shifted from a three to a five level categorical scoring system.

Revised Alternatives

d) Conduct dual field-based projects around storage and exchange in tandem.

- Literature review, but no gap analysis

e) Conduct field-based projects in sequence; first storage, then exchange.

- Literature review, but no gap analysis

f) Initial focus on existing research and identify gaps in existing field research (included storage and/or exchange). Then fill gaps in field research.

- Conduct gap analysis first
- Then conduct field research to fill gaps

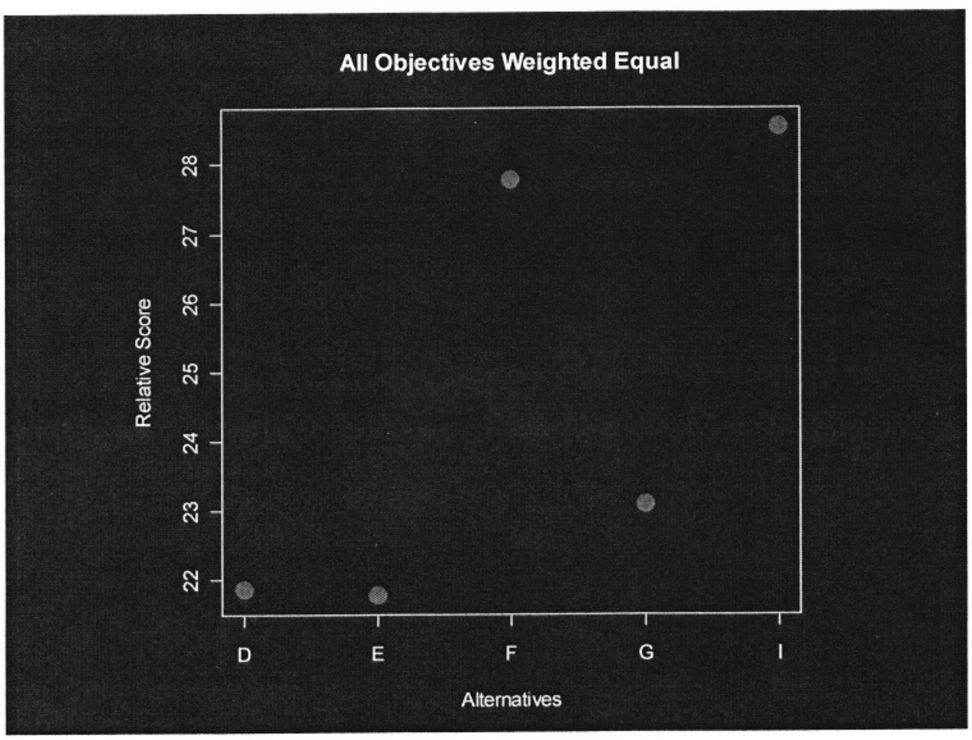
g) Conduct literature research to fill gaps and conduct field research (includes storage and/or exchange) at the same time.

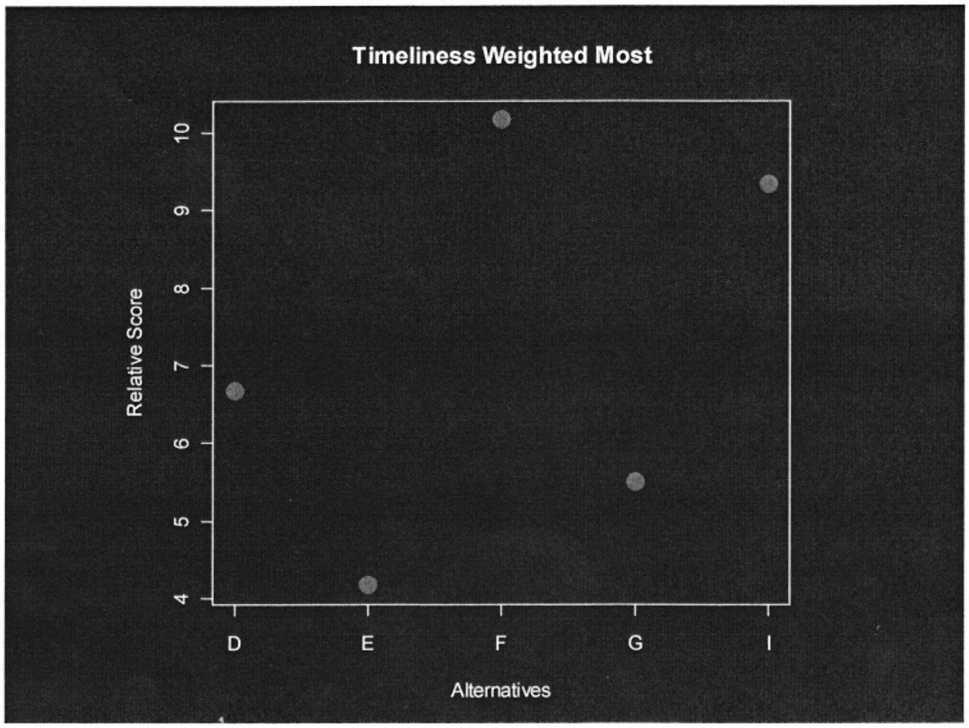
- Literature review, but no gap analysis at start
- Simultaneously start some field research with lit search
- Conduct gap analysis but results may come after starting field research – potential risk of doing the wrong field research in first two years, or so

i) Three timelines of storage & exchange. Assess three timelines of carbon storage and exchange by: 1) reconstructing rates of carbon accumulation over time for millennial timescales, 2) decadal timescales, and 3) current timescales. Includes field based sampling of storage and flux.

- Conduct gap analysis first
- Then conduct field research to fill gaps

The following graphs compare the five selected alternatives directly and weighted.





The evaluation of these five alternatives included revision of metrics to assist in better analysis and included the weighting of those metrics for more precise evaluation. The following two alternatives were selected from the second round of scoring.

1) Initial focus on existing research and identify gaps in existing field research (including storage and/or exchange). Then fill in gaps field research.
   - Conduct gap analysis first
   - Then conduct field research to fill gaps

2) Assess three timelines of carbon storage and exchange by: 1) reconstructing rates of timescales. Includes field based carbon accumulation over time for millennial timescales, 2) decadal timescales, and 3) current sampling of storage and flux.
   - Conduct gap analysis first
   - Then conduct field research to fill gaps

Best Alternative

The second of these alternatives effectively encompasses all elements in the first and performed well under all methods of scoring and weighing and was therefore selected as the best alternative to address our problem statement and objectives. This alternative will be the focus of our follow-up workshops to develop research strategies and proposals. This will include selecting the best model design with compatible inputs/outputs for comparability and transferability, along with structure for literature and current research review and analysis to identify information gaps.